

# Heat treatable for greater hardness and strength

## Outokumpu Dura range datasheet

### General characteristics

The Dura range contains 14 high hardness and precipitation hardening (PH) stainless steel products.

#### Key products

Outokumpu name	Typical applications	Product forms
<b>Dura 420/4021</b> A very popular martensitic stainless steel that is corrosion resistant in water and steam.	<ul style="list-style-type: none"> <li>• Cutting utensils</li> <li>• Surgical instruments</li> <li>• Press plates</li> <li>• Brake discs</li> <li>• Mechanical parts</li> <li>• Flanges and valves</li> </ul>	C, H, P, B, R, S
<b>Dura 420/4034</b> A high-hardness martensitic stainless steel that is corrosion resistant in water and steam.	<ul style="list-style-type: none"> <li>• Professional kitchen knives</li> <li>• Surgical instruments</li> <li>• Press plates</li> <li>• Brake discs</li> </ul>	C, H, S

#### Alternatives

Outokumpu name	Typical applications	Product forms
<b>Dura 410/4006</b> A martensitic stainless steel that is corrosion resistant in water and steam. Mainly supplied as plate or long product for mechanical engineering applications.	<ul style="list-style-type: none"> <li>• Valves</li> <li>• Flanges</li> <li>• Axles</li> <li>• Pump parts</li> <li>• Brake discs</li> </ul>	C, H, P, B, R, S
<b>Dura 4024</b> A martensitic stainless steel with slightly better hardenability than Dura 410/4006 that is corrosion resistant in water and steam.	<ul style="list-style-type: none"> <li>• Mechanical engineering applications</li> <li>• Surgical instruments</li> </ul>	C, H
<b>Dura 4120</b> Similar to Dura 420/4021 but with improved corrosion resistance and high-temperature strength.	<ul style="list-style-type: none"> <li>• Mechanical parts such as shafts</li> <li>• Water and steam turbine blades</li> <li>• Beater blades (especially in the paper industry)</li> <li>• Press plates</li> </ul>	C, H

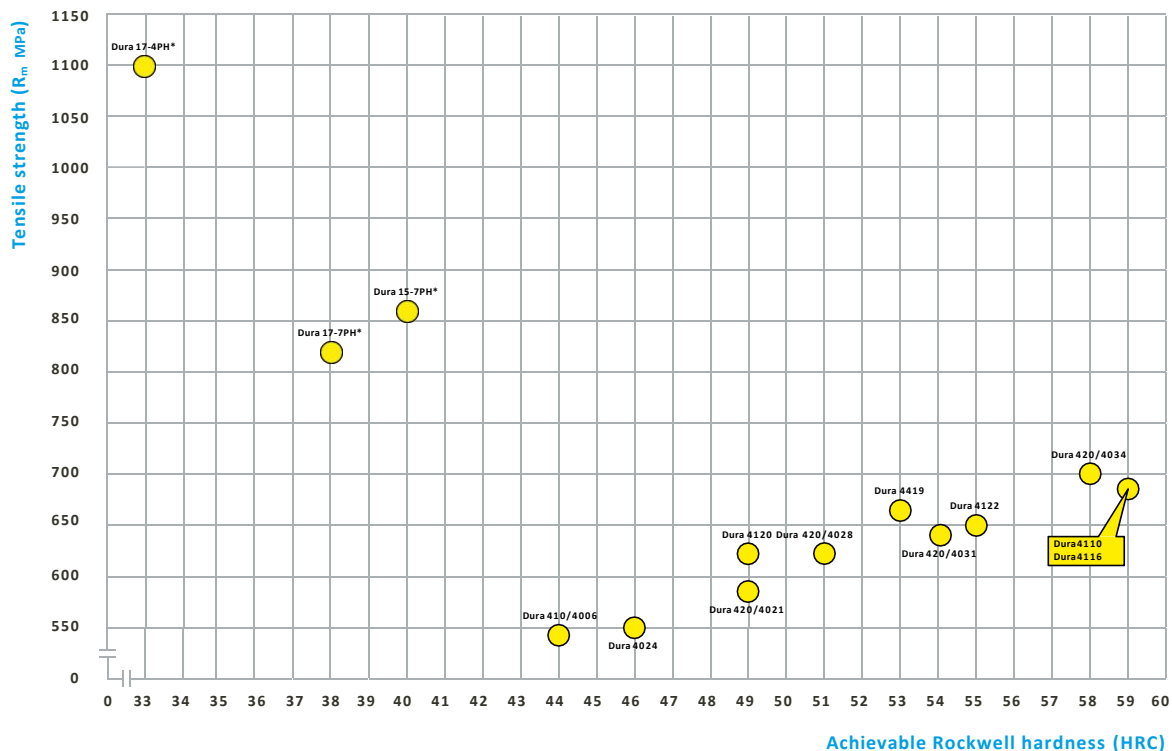
Outokumpu name	Typical applications	Product forms
<b>Dura 420/4028</b> A martensitic stainless steel that is corrosion resistant in water and steam.	<ul style="list-style-type: none"> <li>• Cutting utensils</li> <li>• Surgical instruments</li> <li>• Measuring tools</li> <li>• Flanges and valves</li> <li>• Wear-resistant mechanical parts</li> </ul>	C, H, B, S
<b>Dura 4419</b> Similar to Dura 420/4028, but with improved corrosion resistance and high-temperature strength.	<ul style="list-style-type: none"> <li>• Mechanical engineering applications</li> </ul>	C, H
<b>Dura 420/4031</b> A martensitic stainless steel with medium-high hardness that is corrosion resistant in water and steam.	<ul style="list-style-type: none"> <li>• Cutting utensils</li> <li>• Surgical instruments</li> <li>• Measuring tools</li> <li>• Wear-resistant mechanical parts</li> </ul>	C, H, S
<b>Dura 4122</b> Outokumpu's most corrosion-resistant martensitic stainless steel. Good resistance in moderately corrosive, low-chloride environments and very good mechanical properties and wear resistance. Medium-high hardness.	<ul style="list-style-type: none"> <li>• Surgical instruments</li> <li>• Food processing equipment</li> <li>• Mechanical parts</li> <li>• Machine and pump construction</li> </ul>	C, H, S
<b>Dura 4110</b> A high-hardness martensitic stainless steel with improved corrosion and wear resistance compared to Dura 420/4034.	<ul style="list-style-type: none"> <li>• Knife blades</li> <li>• Scissors</li> <li>• Surgical cutting tools</li> <li>• Measuring tools</li> <li>• Pump construction</li> <li>• Valves</li> </ul>	C, H
<b>Dura 4116</b> Similar to Dura 4110 but with elevated wear resistance.	<ul style="list-style-type: none"> <li>• Cutting instruments that undergo partial hardening</li> </ul>	C, H

## Precipitation hardening stainless steels

Outokumpu name	Typical applications	Product forms
<b>Dura 17-7PH</b> A precipitation hardening stainless steel with high strength and hardness, good corrosion resistance, and satisfactory formability (depending on heat treatment/condition).	<ul style="list-style-type: none"> <li>• Retaining rings</li> <li>• Springs</li> <li>• Valves and flanges</li> <li>• Gears</li> <li>• Aircraft parts</li> </ul>	C, B, R, S
<b>Dura 17-4PH</b> A martensitic precipitation hardening steel with high strength and hardness, good corrosion resistance, and satisfactory formability (depending on heat treatment/condition).	<ul style="list-style-type: none"> <li>• Oil field equipment</li> <li>• Chemical process equipment</li> <li>• Fittings</li> <li>• Pump shafts</li> <li>• Gears</li> <li>• Paper mill equipment</li> <li>• Aircraft parts</li> <li>• Flanges and valves</li> </ul>	C, B, R, S
<b>Dura 15-7PH</b> A precipitation hardening stainless steel with high strength and hardness, good corrosion resistance, and satisfactory formability (depending on heat treatment/condition).	<ul style="list-style-type: none"> <li>• Retaining rings</li> <li>• Springs</li> <li>• Valves</li> <li>• Aircraft parts</li> </ul>	C, S

# Product performance comparison

## Strength vs. Hardness



\*Minimum HRC value

Note: values shown are Outokumpu typical values. For more values by product, please see [yttzhj.com](http://yttzhj.com)

## Chemical composition

Martensitic stainless steels are basically Fe-Cr alloys with higher carbon content than ferritics, which enables them to harden on cooling in air, oil, or water. Depending on the product and intended use, ductility is improved by tempering.

Precipitation hardening products have a higher alloy content than martensitic stainless steels. They contain nickel and, in order to achieve hardening by aging, additions of copper, aluminum, titanium, niobium, and molybdenum. Depending on the chemical composition, their microstructure after final heat treatment is austenitic, semi-austenitic, or martensitic. The chemical composition is given as % by mass.

Outokumpu name	C	Cr	Ni	Mo	N	Others
<b>Key products</b>						
Dura 420/4021	0.2	13	–	–	–	–
Dura 420/4034	0.45	13.7	–	–	–	–
<b>Alternatives</b>						
Dura 410/4006	0.12	12	–	–	–	–
Dura 4024	0.16	13.2	–	–	–	–
Dura 4120	0.21	13.3	–	–	–	–
Dura 420/4028	0.3	12.5	–	–	–	–
Dura 4419	0.38	13.3	–	0.9	–	–
Dura 420/4031	0.38	13.5	–	–	–	–
Dura 4122	0.41	16.1	–	1	–	–
Dura 4110	0.5	14.8	–	0.63	–	–
Dura 4116	0.5	14.4	–	0.55	–	V
<b>Precipitation hardening</b>						
Dura 17-7PH	0.08	17	7	–	–	Al
Dura 17-4PH	0.02	15.5	4.8	–	–	Nb Cu
Dura 15-7PH	0.08	14.5	7.5	2.2	–	1Al

Table uses Outokumpu typical values. The required standard will be fully met as specified in the order.

For the chemical composition list for different standards by stainless steel product, see [yttzhj.com](http://yttzhj.com)

# Products and dimensions

To find the minimum and maximum thickness and width by surface finish for a specific product in the Dura range, please visit [yttzhj.com](http://yttzhj.com)

## Corrosion resistance

### Corrosion resistance of Dura range martensitic stainless steels

In general, the corrosion resistance of martensitic stainless steels varies considerably depending on chemical composition, surface finish, and especially heat treatment. Smooth polished surfaces experience higher resistance than rougher finishes. In terms of heat treatment, the hardened condition is more favorable. Tempering may lead to carbide precipitation, which impairs corrosion resistance.

Precipitation hardening stainless steels have higher corrosion resistance than heat-treatable martensitic stainless steels.

For further information on corrosion resistance, please refer to the corrosion tables in the Outokumpu Corrosion Handbook, available from our sales offices.

## Mechanical properties

Metric						
Outokumpu name	Product form	Yield strength R <sub>p0.2</sub> (MPa)	Yield strength R <sub>p1.0</sub> (MPa)	Tensile strength R <sub>m</sub> (MPa)	Elongation A (%)	Elongation A <sub>80</sub> (%)
<b>Key products</b>						
Dura 420/4021	C	350	375	580	–	27
	H	360	405	575	29	–
	P	500	580	650	20	–
	R	500	580	650	20	–
	B	550	–	750	8	–
Dura 420/4034	C	375	430	660	–	24
	H	400	480	640	24	–
<b>Alternatives</b>						
Dura 410/4006	R	340	430	580	30	–
	B	500	–	700	9	–
Dura 4024	C	–	–	550	–	–
Dura 4120	C	–	–	620	–	–
Dura 420/4028	C	390	430	640	–	23
	H	360	410	600	28	–
Dura 4419	C	–	–	660	–	–
Dura 420/4031	C	–	–	640	–	–
Dura 4122	C	460	490	720	–	22
Dura 4110	C	410	460	690	–	24
	H	425	485	670	22	–
Dura 4116	C	390	430	640	–	23
	H	410	490	670	22	–
<b>Precipitation hardening stainless steels</b>						
Dura 17-7PH	H	330	360	850	37	–
	P	210	240	700	50	–
	R	210	240	700	50	–
Dura 17-4PH	R	850	1050	1100	22	–
	B	600	–	900	10	–
Dura 15-7PH	C	320	340	860	–	25

Figures in table are Outokumpu typical values

A<sub>80</sub> initial length = 80 mm, A initial length = 5.65√S0

Product forms: cold rolled coil and sheet (C), hot rolled coil and sheet (H), Quarto plate (P), wire rod (R), cold drawn bar, 10 < d ≤ 16mm (B). More forms may be available than are shown in the table

For more info, see [yttzhj.com](http://yttzhj.com)

Imperial				
Outokumpu name	Product form	Yield strength $R_{p0.2}$ (ksi)	Yield strength $R_{p1.0}$ (ksi)	Tensile strength $R_m$ (ksi)
<b>Key products</b>				
Dura 420/4021	C	51	54	84
	H	52	59	83
	P	73	84	94
	R	73	84	94
Dura 420/4034	C	54	62	96
	H	58	70	93
<b>Alternatives</b>				
Dura 410/4006	R	49	62	84
Dura 4024	–	–	–	–
Dura 4120	–	–	–	–
Dura 420/4028	C	57	62	93
	H	52	59	87
Dura 4419	–	–	–	–
Dura 420/4031	–	–	–	–
Dura 4122	C	67	71	104
Dura 4110	C	59	67	100
	H	62	70	97
Dura 4116	C	57	62	93
	H	59	71	97
<b>Precipitation hardening stainless steels</b>				
Dura 17-7PH (4568)	H	48	52	123
	P	30	35	102
	R	30	35	102
Dura 17-4PH	R	123	152	160
Dura 15-7PH (632/4574)	C	46	49	125

Figures in table are Outokumpu typical values.

Product forms: cold rolled coil and sheet (C), hot rolled coil and sheet (H), Quarto plate (P), wire rod (R). More forms may be available than are shown in the table.

For more information, please see [yttzhj.com](http://yttzhj.com)

# Physical properties

Metric						
Outokumpu name	Density [kg/dm <sup>3</sup> ]	Modulus of elasticity at 20 °C [GPa]	Coefficient of thermal expansion 20–100 °C [10 <sup>-6</sup> / K]	Thermal conductivity at 20 °C [W/(m*K)]	Thermal capacity at 20 °C [J/(kg*K)]	Electrical resistivity at 20 °C [Ω*mm <sup>2</sup> / m]
<b>Key products</b>						
Dura 420/4021	7.7	215	10.5	30	460	0.6
Dura 420/4034	7.7	215	10.5	30	460	0.55
<b>Alternatives</b>						
Dura 410/4006	7.7	215	10.5	30	460	0.6
Dura 4024	–	–	–	–	–	–
Dura 4120	–	–	–	–	–	–
Dura 420/4028	7.7	215	10.5	30	460	0.65
Dura 4419	–	–	–	–	–	–
Dura 420/4031	7.7	215	10.5	30	460	0.55
Dura 4122	7.7	215	10.4	15	430	0.8
Dura 4110	–	–	–	–	–	–
Dura 4116	7.7	215	10.5	30	460	0.65
<b>Precipitation hardening stainless steels</b>						
Dura 17-7PH	7.8	200	13	16	500	0.8
Dura 17-4PH	7.8	200	10.9	16	500	0.71
Dura 15-7PH	–	–	–	–	–	–

Imperial						
Outokumpu name	Density [lbm/in <sup>3</sup> ]	Modulus of elasticity [psi]	Coefficient of thermal expansion 68–212 °F [μin / (in* °F)]	Thermal conductivity [Btu/(hr*ft* °F)]	Thermal capacity [Btu/(lbm* °F)]	Electrical resistivity [μΩ*in]
<b>Key products</b>						
Dura 420/4021	0.278	31.1 *10 <sup>6</sup>	5.83	17.3	0.11	23.62
Dura 420/4034	0.278	31.1 *10 <sup>6</sup>	5.83	17.3	0.11	21.65
<b>Alternatives</b>						
Dura 410/4006	0.278	31.1 *10 <sup>6</sup>	5.83	17.3	0.11	23.62
Dura 4024	–	–	–	–	–	–
Dura 4120	–	–	–	–	–	–
Dura 420/4028	0.278	31.1 *10 <sup>6</sup>	5.83	17.3	0.11	25.59
Dura 4419	–	–	–	–	–	–
Dura 420/4031	0.278	31.1 *10 <sup>6</sup>	5.83	17.3	0.11	21.65
Dura 4122	0.278	31.1 *10 <sup>6</sup>	5.78	8.7	0.103	31.5
Dura 4110	–	–	–	–	–	–
Dura 4116	0.278	31.1 *10 <sup>6</sup>	5.83	17.3	0.11	25.59
<b>Precipitation hardening stainless steels</b>						
Dura 17-7PH	0.282	29 *10 <sup>6</sup>	7.22	9.2	0.119	31.5
Dura 17-4PH	0.282	29 *10 <sup>6</sup>	6.06	9.2	0.119	27.95
Dura 15-7PH	–	–	–	–	–	–

# Fabrication

Martensitic and precipitation hardening stainless steels are heat treatable and can therefore provide a wide range of different hardnesses and strengths. For workability purposes they are supplied in a solution-annealed condition. The downstream manufacturer performs final heat treatment to achieve the required mechanical properties.

Dura 17-4 PH is furnished in the solution-annealed condition, designated Condition A. This is obtained by heating to 1040 °C/1900 °F ± 15 °C/25 °F and then cooling to below 32 °C/90 °F. The mechanical properties may be altered by subsequent age-hardening treatments.

Note: Aging will cause slight dimensional changes.

## Welding

Traditional martensitic steels with carbon content greater than 0.20% are difficult to weld and assistance is advised. The hardenable high-carbon grades are not suitable for welding.

If thinner gauges of martensitic steel are occasionally welded, the use of lowhydrogen methods (MAG or TIG) is preferred to avoid cold cracking. Any electrodes used must be of the basic type.

Martensitic steels must be preheated to temperatures above MS (typically 250–400 °C/480–750 °F). The interpass temperature should be in the same range, and heat input should not be too high or too low (0.5–1.5 kJ/mm).

Austenitic fillers are the most commonly used. This avoids the need for the post-weld heat treatment necessary when compositionally matched filler is used. Much depends on the composition of the steel and the degree of restraint employed. When there is no preheating, post-weld heat treatment is necessary; however, it may be possible to weld very thin gauges without preheating.

Welding of precipitation hardened grades is possible, but some limitations might have to be taken into account depending on the grade.

Outokumpu assists users and fabricators in the selection, qualification, installation, operation, and maintenance of Dura range products. Technical personnel, supported by our research laboratory, can draw on years of field experience with Dura range products to help you choose the most appropriate materials for your specific application.

Contact us at [yttzhj.com](http://yttzhj.com) for more information.

# Standards and approvals

The most commonly used international product standards are given in the table below. For a list of standards by product, see [yttzhj.com](http://yttzhj.com)

## Standards

Dura range stainless steels meet the following standards:

ASME SA240M Code Sect. II. Part A ASTM A240/A240M  
ASTM A240M EN 10088-2  
EN 10088-3  
EN 10088-4  
EN 10088-5

## Certificates and approvals

Outokumpu meets the most common certifications and approvals including:

- AD 2000 Merkblatt
- Approval of Material Manufacturers
- Factory Production Control Certificate
- ISO 9001
- ISO 14001
- ISO 50001
- ISO/TS 16949
- NORSOK
- OHSAS 18001
- Pressure Equipment Directive (PED)

For the list of certificates and approvals by mill, see [yttzhj.com](http://yttzhj.com)

# Contacts and enquiries

## Contact us

Our experts are ready to help you choose the best stainless steel product for your next project.

[yttzhj.com](http://yttzhj.com)

# Working towards forever.

We work with our customers and partners to create long lasting solutions for the tools of modern life and the world's most critical problems: clean energy, clean water, and efficient infrastructure. Because we believe in a world that lasts forever.

outokumpu classic			outokumpu pro					
<b>Moda</b> Mildly corrosive environments	<b>Core</b> Corrosive environments	<b>Supra</b> Highly corrosive environments	<b>Forta</b> Duplex & other high strength	<b>Ultra</b> Extremely corrosive environments	<b>Dura</b> High hardness	<b>Therma</b> High service temperatures	<b>Prodec</b> Improved machinability	<b>Deco</b> Special surfaces

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